Title:

Visual indicating device.

This invention relates to a visual indicating device and more particularly to an analogue device for showing the time or elapse of time. It is to be understood that the device of this invention may be used generally to indicate various parameters such as are shown on customary analogue dial or gauge indicating devices.

In accordance with this invention there is provided a visual indicating device comprising two or more discs each disc having a radial discontinuity to thereby form a surface of which the plane progresses in a helical manner, said discs being superposed and interleaved and lying in mutually parallel helical planes, each disc being independently rotatable about a common axis by drive means adapted to selectively rotate one or other of the discs, whereby the discs, when viewed axially face on, display overlapping visually contrasting segments having an area or position representative of the relative positions of rotation of the discs and representing a value of a parameter to be displayed by the device.

One disc may be mounted to extend laterally from a shaft, the other disc may be mounted to extend from the surface of a cylinder in which the shaft rotates. The shaft being mounted coaxially within the cylinder with the cylinder having a helical slot in the wall thereof and through which the disc mounted on the shaft may extend. Rotation of the shaft relative to the cylinder producing relative axial movement between the shaft and the cylinder by virtue of the disc

riding in the slot in the cylinder and causing the one disc which is overlying the other disc to mask, or expose, the other disc by an extent dependent on the relative positions of rotation.

An end of the shaft may include a drive, such as an integral cog with an associated drive means. The shaft being driven during one half a revolution of the drive means, the outer cylinder being driven for the other one half revolution of the drive means. By this means the outer cylinder, when held against rotation, moves down telescopically over the shaft during rotation of the latter after which, in a terminal position, the outer cylinder is then rotated to move up over the shaft which is held against rotation.

The outer cylinder may comprise a barrel member which embraces the inner shaft also comprising a coaxially located barrel member. More than two barrels may be provided functioning within in a similar manner.

This invention is more particularly described with reference to the drawings showing, in a diagrammatic way, one embodiment of a time indicating device in accordance with this invention. In the drawings:

Fig.1. shows two disc parts, separated, which provide the visual indication when interleaved;

Fig.2. shows the gear assembly parts, separated, which rotates the discs;

Fig.3. a) to c) shows an assembled basic device, according to this invention, in side view and in three positions of rotation;

Fig.4. a) to c) shows a detail of the drive gearing, seen from below;

Fig.5. a) to d) shows the discs, face-on, in four positions of rotation;

Fig.6. shows another embodiment of the device in side elevation;

Fig.7. shows the device of Fig. 6 in an alternative position;

Fig.8. a) shows the individual barrel components assembled and in side elevation, and b) to d) show the individual barrel components separated in side elevation;

Fig.9. a) to d) show in plan view the barrels and discs attached to the barrels corresponding in views to Fig. 8;

Fig.10. a) to d) shows the drive cogs for each barrel in plan view corresponding in views to Fig. 8;

Fig.11. a) to d) shows the drive cogs of Fig. 10 in side elevation;

Fig.12. a) to h) shows plan views of the discs and the indications presented for various times of the day;

Fig.13. a) to d) show in plan view a more complex arrangement with three disc and cylinder assemblies to show hours, minutes and seconds, and

Fig.14. a) to d) show the arrangement of Figs. 13 in side elevation.

The basic principle of this invention is now described with reference to Figs. 1 to 5. As shown in Figure 1, the basic device comprises two discs 1 and 2 wherein each disc has a radial discontinuity or cut 3 and 4 respectively whereby the disc then forms a surface of which the plane progesses in a helical manner. Disc 1 is mounted on a shaft 5 and disc 2 is mounted on a cylinder

6. The cylinder 6 has a helical slot 7 in the wall. The shaft 5 may be passed into the cylinder 6 and the edge 1a of the disc 1 may engage between the opening formed by the edges 2a and 2b of disc 2 whereby on rotation of disc 1 the edge 1a may pass between the edges 2a and 2b and extend below the disc 2 whilst at the same time the inner part of the disc moves along the helical slot 7. In this way both the discs may become superposed and interleaved and thus lie in mutually parallel helical planes with one disc overlying the other as seen in end view looking in direction A. Thus the relative positions of rotation of the discs 1 and 2 will cause differing exposures of the end faces of one or other of the discs, such that the relative position of rotation can be visually appreciated. Thus from a starting position where the edge 1a is just entering the gap between the edges 2a and 2b of disc 2, disc 1a will be fully exposed and as disc 1a rotates in a clockwise direction the surface of disc 2 will be progressively exposed until disc 1 lies wholly beneath disc 2. If disc 2 is then rotated in a similar clockwise direction the surface will pass beneath the disc 1 to a position where the whole of the surface of disc 1 will again be exposed.

In order to provide for this sequence of progressively covering over the surface of disc 1 and thereafter uncovering the surface whilst maintaining a continuous clockwise direction of rotation, shaft 5 of disc 1 may be considered as relatively fixed to a base member whereas the cylinder 6 and disc 2 are free to ride up and down over shaft 5. Thus by rotating shaft 5 in a clockwise direction, cylinder 6 will move upwards with disc 2 to an initial limit position after one full revolution of shaft 5. If at this point shaft 5 is stopped from rotation but shaft 6 is then rotated in a clockwise direction, disc 1 will progressively be exposed whilst the cylinder 6 moves downwards on the shaft 5. This sequence

will be repeated for as long as shaft 5 and cylinder 6 are sequentially rotated in a clockwise direction with firstly one revolution of shaft 5 followed by one revolution of cylinder 6.

Figure 2 shows one means of achieving this and there is shown a gear which has two portions being a lower portion 20 with a plurality of teeth 21 extending around 180° of the circumference and with a second portion 22 with a second plurality of teeth 23 extending around the diametrically opposed 180° of the circumference.

The lower end of shaft 5 includes the gear which engages the gear teeth 21 on portion 20 and the cylinder 6 has a similar gear which engages the gear teeth 23 on the portion 22. The gears on shaft 5 and cylinder 6 extend around the whole 360° of the circumference but the number of teeth correspond to the number of teeth on the gear parts 21 and 23. Thus 180° revolution of the gear 20, 22 produces a full revolution of shaft 5 or cylinder 6. The gear teeth 23 on the portion 22 are sufficiently wide in order that the gear of cylinder 6 may remain in engagement as the cylinder moves longitudinally along shaft 5.

The assembly is shown in Figures 3a to 3c in side view and as may be seen, a gear 30 is secured to the end of shaft 5 which carries disc 1 and a gear 31 is secured around the outside of cylinder 6 which carries the disc 2. Referring to Figure 3a, as the gear assembly 20, 22 is rotated in an anticlockwise direction seen from above, the teeth 21 engage the gear 30 and thus rotate shaft 5 clockwise causing the cylinder 6 to be moved upwardly as disc 1 progressively moves beneath disc 2. Figure 3b shows the position after 90° of revolution of 20, 22 and in the position shown in Figure 3c the teeth 21 are about to disengage from the gear 30 after 180° revolution of 20/22 and

thus 360° revolution of gear 30. At this point, gear teeth 23 now commence engagement with gear 31 and cylinder 6 is caused to rotate in a clockwise direction (as seen from above) which now causes the cylinder 6 to move downardly and thus for disc 2 to move beneath disc 1. After a further 180° revolution, gear teeth 23 now disengage from gear 31 and gear teeth 21 re-engage with gear 30, thus the sequence of disc covering and uncovering proceeds continuously for as long as the gear 20, 22 is rotated in the same direction.

In order to prevent friction rotating the the shaft 5 or cylinder 6 when disengaged from a respective gear part 21 or 22, a ratchet means is provided (not shown here) or sufficient friction is applied to the shaft or cylinder to prevent rotation. This can conveniently be achieved through a thin ratchet blade engaging gear 30 and gear 31 whereby positive rotation of either part overcomes the bladed force.

Figures 4a, b and c show the gears viewed from below as shown in Figure 3 and in the same relative positions as in Figures 3a, 3b and 3c. As may be seen in Figure 4a, the gear teeth 21 are commencing engagement with gear 30, in Figure 4b the rotation of shaft 5 is half way through the sequence and in Figure 4c the complete revolution of shaft 5 is finished and gear teeth 23 are now commencing engagement with gear 32 (not shown here). Figures 5a to 5d show the discs viewed in the direction of arrow A in Figure 1, and in Figure 5a there is shown the position of the discs corresponding to Figure 3a with shaded disc 1 fully overlying unshaded disc 2. Figure 5b shows an intermediate position after approximately 45° of rotation of shaft 5 with a disc 2 being shown partially uncovered. Figure 5c corresponds to the position shown

in Figure 3b, with disc 2 now uncovered by one half and in Figure 5d there is shown the position of Figure 3c with disc 2 now fully uncovered. Further rotation will now cause disc 1 to emerge from beneath disc 2 and to progressively cover the surface as gear 31 rotates to move cylinder 6 downwards.

In a practical application for a timepiece, the gears 20, 22 will be rotated once every 24 hours. Thus the position shown in Figure 5a might, for example, represent midnight, the position shown in Figure 5b might represent 3 a.m., the position shown in Figure 5c might represent 6 a.m. and the position shown in Figure 5d would represent midday, that is with the whole of disc 2 (the lighter coloured disc) exposed. For the next 180° revolution of 20, 21 the unshaded disc would progressively uncover the shaded disc and this would then represent time after midday and progressing up to midnight, where the shaded disc would be fully exposed.

By this means, the device according to this invention in its basic form, can provide a very quick and readily appreciated visual indication of the time, or indeed any other parameter, which requires an indication to be presented on a time advancing basis.

There now follows a description of further embodiments of this invention which utilise a more practical arrangement having two concentric cylinders, although the principal of operation is as previously described.

Referring to Figs 6 to 11 of the drawings the device has three concentric

cylinders B01, B02 and B03 forming barrel system B00. Outer cylinder B01 is free to slide up and down the inner cylinder B02 which, in turn, is mounted over the central base cylinder B03. The cylinders are all freely and relatively rotatable. The base cylinder B03 forms a support for the device and may include a mounting means.

Outer cylinder B01 has a base mounted cog B01.1 and inner cylinder B02 has a base mounted cog B02.1 forming the barrel and barrel cog system B00. The cylinder B01 is provided with a helical slot D through the wall, and here shown with two complete turns around the circumference, and a helical disc A01 (forming part of disc system A00) extending one turn around the circumference medially within the confines of the circumference defined by the slot and fixed in position to the outer surface of the cylinder.

The inner cylinder B02 also has a single turn disc A02 (forming the other part of disc system A00) arranged so that the disc may extend through the slot D. In this arrangement rotating cylinder B01 clockwise (as seen from above) from the position shown in Fig. 1 results in the terminal position shown in Fig. 7 after one full revolution, and *vice versa*. This action occurs as inner cylinder B02 is stationary and the slot D thus rides down along the discA02.

If, conversely, and from the position of Fig. 7 cog B02.1 rotates inner cylinder clockwise then disc A02 is caused to travel down the slot D and the cylinders thus return to the position of Fig. 6.

The cogs B01.1 and B02.1 are each driven through cogs C01 and C02 respectively by a drive C03 forming cog system C00 and turning one revolution

for each twenty four hour period. The cogs C01 and C02 are twice the diameter of the barrel cogs B01.1 and B02.1 and have engagement teeth around only one half of the circumference and phased by 180°. Thus when the teeth of C01 disengage from B01.1 after twelve hours (position of Fig. 7) the teeth on C02 then engage B02.1 and outer cylinder B01 stops rotating and inner cylinder B02 starts rotating back to the Fig. 6 position after an elapse of a further twelve hours.

Figs 8 to 11 shown the components in more detail and Fig. 5b an c shows the configuration of the teeth on cogs C01 and C02 more clearly with Fig 10a showing the superimposed teeth.

The discs A01 and A02 have contrasting colours and when viewed from above the visual aspect is of different colour segments according to the relative rotational positions from which there is an indication of time. Fig.12 A to H shows eight different visual presentations for three hourly times from 12:00 p.m. through 12:00 a.m. to 9:00 p.m. This involves on revolution of C03 for each twenty four hour period. In an alternative arrangement the discs may have different textures, be of different materials or of different shades or patterns.

Figs 13 and 14 are views of a more comprehensive indicating system showing three disc systems A01 and A02, A03 and A04, A05 and A06 for hours, minutes and seconds respectively. The hours discs A01 and A02 move and provide an indication as previously described. The minutes discs A03 and A04 and associated cylinders are located coaxially around the hours discs and the associated mechanism drives the discs in a similar manner but with the

appropriate relative difference in timing. In a similar way the seconds discs A05 and A06 are located with the cylinders coaxially around the minutes and hours cylinders and driven to provide the correct time relationship.